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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/647,534	08/26/2003	Anthony Dip	240579US6YA	2715
22850	7590	06/17/2005	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			MALDONADO, JULIO J	
			ART UNIT	PAPER NUMBER
			2823	

DATE MAILED: 06/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/647,534

Applicant(s)

DIP ET AL.

Examiner

Julio J. Maldonado

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 March 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-12 and 17-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-12 and 17-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

1. The rejection as set forth in Office Action mailed on 01/11/2005 is withdrawn in view of applicants' amendments filed on 03/30/2005.
2. Applicants' cancellation of claims 3 and 13-16 and addition of claims 17-20 is acknowledged.
3. Claims 1, 2, 4-12 and 17-20 are pending in the application.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 2, 4, 5, 6, 8, 10, 11 and 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gonzalez et al. (U.S. 6,194,327 B1) in view of Park et al. (A study on modified silicon surface after  $\text{CHF}_3\text{C}/\text{C}_2\text{F}_6$  reactive ion etching).

In reference to claims 1, 4, 5, 6, 8, 10 and 11, Gonzalez et al. (Fig.1) teach a method of cleaning silicon substrate surfaces including the steps of growing a first layer of silicon oxide by thermal oxidation on the surface of the substrate; first etching said first oxide layer; growing a second silicon oxide layer by thermal oxidation; etching said second oxide layer; and repeating said oxidation and etching steps as desired until removing contaminant or substrate surface damage, wherein said etching steps are thermal vapor etching using  $\text{H}_2$  and  $\text{F}_2$  as etchants (column 2, line 55 – column 4, line 47).

Gonzalez et al. fail to expressly teach monitoring said surface region of the substrate and repeatedly growing an additional ultra-thin oxide layer to consume additional defects and etching the additional oxide layer to remove the consumed additional defects based on said monitoring of said surface region, wherein said monitoring comprises using high-resolution transmission electron microscopy (HRTEM). However, it is inherent that there has to be an inspection step to detect level of contaminants on a substrate in order to continue or stopping said growing and etching steps until all of the contaminant or substrate surface damage has been removed. Furthermore, Park et al. teach a monitoring method to detect level of contaminants on a substrate, wherein said monitoring includes HRTEM (Abstract). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Gonzalez et al. and Park et al. to enable monitoring the reduction of contaminants in the substrate of Gonzalez et al. according to the teachings of Park et al. because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable methods of monitoring the substrate of Gonzalez et al. and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

In reference to claim 2, the combined teachings of Gonzalez et al. and Park et al. fail to teach growing said oxide layers having a thickness of between 5Å and 15Å. Notwithstanding, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed

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that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

In reference to claims 17-20, the combined teachings of Gonzalez et al. and Park et al. inherently teach wherein said monitoring includes imaging the surface of the substrate after removal of one of said ultra-thin oxide layers using HRTEM data. Further support can be found in Wolf et al. (Semiconductor Processing for the VLSI Era, Volume 1: Process technology, pages 586, 587 and 597-599) and Herbots et al. (Figs.6A-6B and column 19, lines 15 – 40) and furthermore, since the same monitoring is used, the same data results would be obtained.

6. Claims 1, 7, 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pai et al. (U.S. 6,764,967 B2) in view of Park et al. (A study on modified silicon surface after  $\text{CHF}_3\text{C}/\text{C}_2\text{F}_6$  reactive ion etching).

Pai et al. (Fig.1) teach a method of removing defects from the surfaces of a plurality of silicon substrates including the steps of placing said substrates on a chamber; growing a first oxide layer on each of the surfaces of the substrates; etching

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said first oxide layer; growing a second oxide layer on each of said surfaces of said substrates; etching said oxide layer from each of the surfaces of the substrates, wherein said etching steps are wet etching steps; forming an additional layer on one of said first and second oxide layer using thermal oxidation; and repeating said oxidation and said etching steps until said defects are removed (column 3, line 39 – column 5, line 59).

Pai et al. fail to expressly teach monitoring said surface region of the substrate and repeatedly growing an additional ultra-thin oxide layer to consume additional defects and etching the additional oxide layer to remove the consumed additional defects based on said monitoring of said surface region, wherein said monitoring comprises using high-resolution transmission electron microscopy (HRTEM). However, it is inherent that there has to be an inspection step to detect level of contaminants on a substrate in order to continue or stopping said growing and etching steps until all of the contaminant or substrate surface damage has been removed. Furthermore, Park et al. teach a monitoring method to detect level of contaminants on a substrate, wherein said monitoring includes HRTEM (Abstract). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Pai et al. and Park et al. to enable monitoring the reduction of contaminants in the substrate of Pai et al. according to the teachings of Park et al. because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable methods of monitoring the substrate of Gonzalez et al. and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

***Response to Arguments***

7. Applicant's arguments with respect to claims 1, 2, 4-12 and 17-20 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Julio J. Maldonado whose telephone number is (571) 272-1864. The examiner can normally be reached on Monday through Friday.

10. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (571) 272-1855. The fax number for this group is 703-872-9306 for before final submissions, 703-872-9306 for after final

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submissions and the customer service number for group 2800 is (703) 306-3329.

Updates can be found at <http://www.uspto.gov/web/info/2800.htm>.

Julio J. Maldonado  
Patent Examiner  
Art Unit 2823

Julio J. Maldonado  
June 13, 2005



George Fourson  
Primary Examiner